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Abstract

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Development Trajectories of River Basins: A Conceptual Framework

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The development of societies is shaped to a large extent by their resources base, notably water resources. Access to and control of water depend primarily on the available technology and engineering feats, such as river-diversion structures, canals, dams and dikes. As growing human pressure on water resources brings actual water use closer to potential ceilings, supply-augmentation options get scarcer, and societies, therefore, usually respond by adopting conservation measures and by reallocating water towards more beneficial uses.

Several frameworks and diagrammatic representations of great heuristic value have been proposed to conceptualize the development of river basins and can be found in the literature on water resources. They usually distinguish between three successive phases, whereby supply, conservation and allocation-oriented strategies are elicited by growing water scarcity. These frameworks have brought into sharp focus the crucial phenomenon of basin closure—the gradual committing and depletion of available renewable resources—making it legible and straightforward. At the same time, the simplicity of these representations may not allow one to capture the deeper heterogeneity of the processes that underlie the historical relationship between a particular society and its water resources. This report reviews these various conceptualizations of development of river basins over time. It identifies their similarities and differences and singles out limitations that are addressed in more detail.

The report first shows that distinguishing between several categories of water sources, instead of considering them as a whole, provides additional insight into how water resources are put into use and controlled. It proposes a disaggregated view of four different categories of water (rainwater, stream water, regulated surface water and underground water), allowing for a more comprehensive understanding of how the actual and potential use of the different sources of water relate to each other, and of what the scope for improvement is. These four categories also correspond to varied degrees of control over water, a dimension that needs to be considered when addressing the issue of improving the management and reliability of the supply of water.

A typology of societal responses to water scarcity is then presented in the report. It emphasizes the need to distinguish between responses devised by the state at the national level, and those of individual farmers and small groups or communities at the local level, although both responses are partly interdependent. While emphasis is often placed on remedial measures expected from the government and on state policies, adjustments made by local actors appear to be often very significant. Water users/managers are not passive when confronted with water shortages. The very lack of water signals its scarcity to users and elicits adjustments such as conjunctive use of water, and technical or institutional change. Macro and micro responses can be further broken down into three

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conventional types (supply augmentation, conservation and reallocation). It is shown, however, that these categories are not as straightforward as they appear to be. Because of the interconnectedness of users throughout the hydrological cycle (particularly upstream/downstream and surface water/groundwater linkages) they are not purely additive. A multi-scale analysis is necessary to characterize the actual global impact of distributed local strategies. In closing basins, what locally appears as conservation or supply augmentation is all the more likely to be tantamount to spatial reallocation when seen at a larger scale.

Whether these responses occur sequentially is examined by referring to several empirical situations. These provide various illustrations of specific historical evolutions and patterns that do not accord with the reviewed frameworks. Although the conventional three-phase sequence provides, in many cases, a useful first-level description, these examples show that particular physical and human contexts give way to specific variations.

The report singles out a few elements which appear to be crucial in shaping responses. The nature of the state and state/citizenry relationships defines the room for maneuver and adjustment allowed to the different actors in the system. Management and decision-making power may oscillate between the state, communities, or market mechanisms, depending on the historical circumstances. "Shock events," such as floods, famines or droughts, are also of paramount significance in shaping trajectories and strategy shifts. The nature of the political and economic situation also strongly influences the nature of the choices eventually made by the different actors in response to pressure on resources. Regional politics, for example, lead to shifting the tradeoff point between efficiency and equity by generating claims for the development of water-resources in marginal areas based on particular political clout or equity considerations. Individual and societal responses are also strongly governed by what can be termed "agrarian pressure and defined—for a given technological level—as the pressure on land and water resources relative to the availability of livelihood opportunities in the local or wider economy. Agrarian pressure determines, in the first place, the urgency of public investment/reforms in the agricultural and water sector and how this is felt by decision makers and pressed for by politicians.

Existing linear visions of basin development tend to be based on economic rationality or on concepts of social adaptiveness that are too restrictive or too difficult to evaluate. Societal responses to scarcity of resources, at both the local and the state level, are driven not by economic considerations or locally perceived needs alone. It is argued that they must be understood not only on the basis of hydrological, physical or economic constraints, but within a wider political and economic framework that considers the distribution of human agency and power among actors, as well as their respective interests and strategies. Such a framework takes into account the asymmetries of power and information and links evolutions and choices to the resulting distribution of costs and benefits (monetary and otherwise), looking at technical and institutional changes as both demand- and supply-driven.

The last section of the report attempts to devise an alternative conceptual framework that is comprehensive enough to account for the evolution of a wide variety of river basins, while avoiding reducing them to a single, oversimplified form. It takes a longer timeframe perspective, allowing for growth and collapse phases and stressing the succession of relative basin-closure thresholds, and proposes to analyze historical transformations of both the landscape and the society through an open political economy that does not prejudge what particular options will be adopted at a specific point in time.

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